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Memorandum

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Date: *May 9, 2007*

Subject: *Design Summary Report*
100% Design Submittal - Former Bldg. 1/36 Pilot Biorecirculation Test, Remediation of Volatile Organic Compounds
Former C-6 Facility, Los Angeles, California

Camp Dresser & McKee Inc. (CDM) has prepared this memorandum summarizing the design basis, process description, and groundwater modeling results for a pilot biorecirculation system at Former Bldg 1/36 area of the Former C-6 Facility (Site). 100% Design Submittal drawings have been previously submitted under a separate cover (CDM, April 2, 2007).

The pilot test will involve extracting, amending, and injecting groundwater to facilitate in situ bioremediation at the Site. Groundwater will be extracted and pumped to an injection manifold, where it will be amended with either liquid (most likely lactate) or solid (Whey) electron donor and mixed prior to being reinjected into existing amendment wells. It is planned to use the existing injection manifold (in Connex box) from C-1, Bldg 3 facility (to the extent feasible) with additional equipment. The key test components are described below:

Extraction wells (Table 1)

- One B-Sand well, EWB001
- Anticipated flow rate: 12 gpm

- Use new pump Model # 22 Redi-Flo3-180 (1 HP) with existing pump controller from Bldg 3 injection manifold (Redi-Flo3 CU 300)

Injection wells (Table 1)

- 4 existing amendment wells located Vault 2: AW0067UB, AW0066UB, AW0065UB, and AW0064UB.
- All wellhead connections made at the Vault.
- Wellheads to be exposed and reconstructed as monitoring wells.
- Install battery operated pressure transducers (***Level TROLL®*** or equal) in each of the injection wells to monitor water levels.
- Monitor injection line pressures for fouling.

Monitoring Wells (Table 1)

- Performance Monitoring Wells – Use combination of existing amendment and monitoring wells and one new well.
- Wellheads of existing amendment wells to be exposed and reconstructed as monitoring wells.
- Install one new observation well EWB002 (construct as extraction well) – See Attachment B for well construction details.
- Option of installing battery operated pressure transducers (to log water levels) or perform manual water level measurements.

Conveyance

- New conveyance piping to connect EWB001 to existing double-contained (4 in x 6 in) spare line will be double-contained (2 in x 4 in) and connect at the nearest subsurface construction stub-out box.
- Combination of existing conduit (from stub out box to compound) and new conduit (from well to stub-out box) for extraction well pump power and control.
- Existing 4-inch remediation spare to distribute amended water from compound/injection manifold to injection wells. Connection to existing amendment wells will be made in Vault 2.

Liquid Amendment Injection System

- Amendment system components from C-1 Bldg 3 Manifold system will be used as appropriate.
  - Plan to use one recirculation loop (equipped with three loops)
  - Will use existing controls (PLC/HMI) and modify as needed
- Electron donor dosing rate will be determined by treatability study (in progress). Based on initial dosing calculations, approximately 600 gallons of Sodium lactate would be needed per week.

Estimated Donor Concentrations	Estimated Injection Frequency	Estimated Dosage Rates
Max – 30,000 mg/L as pure lactate	10% of the time (approx. 17 hrs/week)	Approx. 6,400 lbs (600 gallons) of sodium lactate /week Metering Pump Rate – 34 gph
Max – 30,000 mg/L as Whey	10% of the time (approx. 17 hrs/week)	Approx 3,000 lbs of Whey per week Feed rate – 180 lbs/hr

  - Liquid electron donor - Need new metering pump (diaphragm or peristaltic tube pump @ 34 gph)

Solid Amendment Injection System

- If solid electron donor is selected (Whey), then a portable solids handling and mixing equipment will be located inside the existing treatment compound
- See Attachment C for portable mixing equipment
- Based on initial dosing calculations, approximately 3,000 lbs of whey would be needed per week.

- Storage area requirements - 2, 2000-lbs super sacks/ week, each on a 4' x 4' pallet – minimum space needed 32 sq feet.

Conceptual Process Controls Overview

As existing amendment system and controls from C-1 will be used, control strategy will be very similar to logic used for that system. The PLC will need to be re-programmed. A wireless communication device will be installed to access the PLC remotely to determine system status. Additional control may be added to monitor injection pressures in the amendment well network and shut down the system if needed.

In general, it is anticipated that system shutdowns will occur if any of the following occur:

- High level or low level in the electron donor containers or electron donor mixing equipment (as appropriate)
- Low water level in the extraction well
- Sustained power outage (which will initiate a controlled shutdown of the HMI/PLC)
- Any pump or motor failure
- High level in the Connex box sump or treatment compound sump
- Unacceptable pressure buildup at any pressure element

In the case of a shutdown, the PLC will shut off all system components, and all automated valves will close. The HMI will initiate a call-out to notify system operators that the system has shut-down so that they can respond and troubleshoot.

The system will also have the following additional controls and instrumentation:

- The system will include the ability to operate system components (e.g. automatic valves and metering pumps) in manual mode.
- The groundwater extraction pump will recognize low-level conditions in the well and will discontinue pumping when that occurs.
- Pressure indicators and transmitters will be installed to monitor pipe conditions throughout the process and initiate shutdowns at unacceptable pressures.
- Flow meter will be installed at the extraction wellhead.

- Each amendment well injection will have a flow meter, solenoid valve, and pressure indicator/switch

A detailed process and control system description will be provided in the O&M Plan.

Attachments

Table 1 –	Summary of Well Construction Information
Attachment A –	Summary of Analytical Groundwater Modeling in Support of Pilot Test Design
Attachment B -	New Well Construction Procedures
Attachment C -	Overview of Portable Whey Injection Unit

Table 1

Summary of Well Construction Information
Former Bldg. 1/36 Pilot Biorecirculation Test
Remediation of Volatile Organic Compounds
Former C-6 Facility, Los Angeles, California

Well ID	Easting	Northing	Casing	Screen	Screen Depth Interval (ft. bgs)	
Pumping Well - Existing						
EWB001	6470381	1769604	6-in PVC	0.02 Inch Slotted PVC	59.2	89.2
Injection Wells (Group A Wells) - Existing						
AW0064UB	6470346	1769801	2-in PVC	0.02 Inch Slotted PVC	68.5	88.5
AW0065UB	6470316	1769802	2-in PVC	0.02 Inch Slotted PVC	68.5	88.5
AW0066UB	6470286	1769802	2-in PVC	0.02 Inch Slotted PVC	69.5	89.5
AW0067UB	6470261	1769810	2-in PVC	0.02 Inch Slotted PVC	70	90
Performance Monitoring Wells (Group B Wells) - New						
EWB002	TBD	TBD	6-in PVC	0.02 Inch Slotted PVC	55	90
Performance Monitoring Wells (Group B Wells) - Existing						
AW0074UB	6470365	1769759	2-in PVC	0.02 Inch Slotted PVC	70	90
AW0075UB	6470332	1769740	2-in PVC	0.02 Inch Slotted PVC	69	89
AW0076UB	6470302	1769740	2-in PVC	0.02 Inch Slotted PVC	69	89
AW0077UB	6470254	1769763	2-in PVC	0.02 Inch Slotted PVC	70.5	85.5
WCC_6S	6470336	1769734	4-in PVC	0.01 Inch Slotted PVC	60	90
AW0073C	6470329	1769765	2-in PVC	0.02 Inch Slotted PVC	96	116
Downgradient Wells (Group C Wells) - Existing						
WCC_12S	6470506	1769496	4-in PVC	0.01 inch slotted PVC	60	90
TMW_7	6470318	1769483	2-in PVC	0.01 inch slotted PVC	65	85
Upgradient Wells (Group D Wells) - Existing						
AW0055UB	6470304	1769863	2-in PVC	0.02 Inch Slotted PVC	69	89

Attachment A
Summary of Analytical Groundwater Modeling in Support of Pilot Test Design

This attachment summarizes the results of analytical groundwater modeling and hydraulic design calculations for assessment of the pilot biorecirculation system at the Site. The objectives of the groundwater modeling are as follows:

- Selection of an appropriate area at Former Bldg 1/36 where pilot testing can be conducted using existing injection (amendment) wells to the maximum extent possible;
- Determination of well locations for monitoring the performance of the pilot test, using existing wells wherever feasible; and
- Determination of appropriate extraction and injection flowrates.

A.1 Modeling Protocol

A simple analytical model (AquiferWin32) was configured to allow rapid assessment of various injection and monitoring layouts. The analytical model assumed uniform properties and a planar groundwater gradient, which is appropriate for the small area being considered and therefore suitable for the purposes of the pilot test design. Existing estimates of hydraulic characteristics derived from slug testing and tracer tests at the Site were utilized for the design evaluation. These data included slug test and aquifer performance tests previously conducted on the B-Sand wells in Former Building 1/36 (WCC-1S, WCC-4s, WCC-5S to 10S, WCC-1D and WCC-3D) conducted by in 1990 (Woodward Clyde, March 1990) and presented in the Groundwater Status Report (Kennedy/Jenks Consultants, October 2000).

A single pumping well that was recently installed in the B-Sand (EWB001) was used in the model to produce water that will be amended for reinjection at up to four existing amendment wells. Simulations conducted utilized a range in hydraulic conductivity to assess the sensitivity of the proposed operations to these assumptions. The evaluation of injection wells were used to select candidate locations that were tested in the model. The distribution of EAB fluids around the injection wells was assessed and suitable monitoring wells with appropriate travel times from the injection points were selected.

The hydraulic properties used in the model are as follows:

- Hydraulic conductivity of 20 ft/day
- Porosity and effective porosity of 0.3

- Hydraulic gradient of 0.002 ft/ft
- Longitudinal dispersivity of 30 feet
- Transverse dispersivity of 3 feet
- Electron donor degradation half-life of 30 days
- Saturated thickness of 32 feet

The 20 ft/day for hydraulic conductivity was selected based on results of the tracer test that was conducted on the Former Building 2 property (ARCADIS, April 2003). The dispersivities were selected based on the length of the plume and literature sources relating plume length to longitudinal dispersivity. The transverse dispersivity was assumed to be 10% of the longitudinal. Review of previously performed slug test and aquifer performance tests in few of the Former Building 1/36 B-Sand wells (Woodward-Clyde, March 1990, and Kennedy/Jenks Consultants, October 2000) showed probable leaky conditions, since water levels stabilized after about 500 minutes of pumping. Analysis of these test as a fully confined system using the Cooper-Jacob approximation to the Theis solution, as was documented in the reports, will not yield representative estimates of hydraulic properties. The aquifer thickness that was used in the calculation of hydraulic conductivity is also likely not appropriate, since these wells appear to be located in the area of the "window" where the B-C aquitard is not present. As a result, this data cannot be used without re-analyzing the APT data conducted in Former Building 1/36 using appropriate methods to obtain the values for the combined zone. For the pilot test, the use of 20 ft/day was deemed to be appropriate. Additionally, monitoring data obtained during the pilot test operation will provide additional information on the K values.

A.2 Modeling Results

Based on the assumptions listed in Section 1.0, the following is a summary of the modeling results:

- Extraction Well, EWB001, completed in the B-Sand, was selected for use as the pumping well. Wells that are suitable as injection wells must be upgradient of the pumping well, but in close enough proximity, so that an enhanced gradient will develop. Such wells must also be close enough so a controlled flow field will develop between the injection wells and pumping well. Existing amendment wells that are not under existing buildings and that meet these criteria include AW0064UB, AW0065UB, AW0066UB, and AW0067UB ("Group A"). These wells are in an east west trending line

approximately 200 feet north of the pumping well. A summary of the key well construction information is presented in Table 1.

- Proposed well locations for monitoring the performance of the pilot test are summarized in Table 1 and listed below:
  - Existing amendment wells AW0074UB, AW0075UB, AW0076UB, and AW0077UB, existing monitoring well WCC_06S, and a proposed well (EWB002) ("Group B"). This line of wells, which are about 50 to 60 feet downgradient from the line of injection wells, will be used as monitoring wells along the flow path from the injection wells to evaluate: donor consumption and distribution; and the effectiveness of the biologically active zones over time.
  - Existing amendment well AW0055UB which will serve as an upgradient sample points to monitor changes in contaminant concentrations entering the treatment zone ("Group D").
  - Existing groundwater monitoring wells TMW_07 and WCC_12S will serve as downgradient sample points to monitor the presence of donor leaving the area of active treatment ("Group C").
- A pumping rate of up to 12 gallons per minute (gpm) is projected for Well EWB001 (assuming that the well is reasonably efficient) which will be injected equally into the 4 injection wells (approx 3 gpm each). Figure 1 shows the capture zone around this well.
- The groundwater velocity is estimated at about 0.8 ft/day based on the induced gradient. A mound will develop near the injection wells and a depression will develop near the pumping well.
- Using the above flowrates and groundwater velocity, concentration plots of estimated electron donor distribution showing the projected location of the 1,000 mg/L contour (which is a threshold that is typically used determine the effectiveness of bioremediation) at approximately 30, 60, and 90-day intervals are shown on the Figures 2, 3, and 4, respectively. This is based on the assumption that electron donor solution is initially injected at a concentration of 30,000 mg/L of pure donor for 10 percent of the time, yielding an average concentration of 3,000 mg/L (Actual injection frequency will vary based on the results of the ongoing treatability testing and performance monitoring during pilot test).

- As seen in the plots, concentrations are estimated to drop below 1,000 mg/L in the downgradient array of monitoring wells (Group B wells), which are about 50 to 60 feet downgradient of the line of injection wells (Group B2 wells). Specific observations from the modeling include:
  - Detectible concentrations of donor compound is expected to reach the observation wells;
  - Steady-state distribution of donor compound is expected at approximately 4 months, with approximately 11,000 square feet treatment area with concentrations greater than 1,000 mg/L; and
  - Breakthrough of donor compound at the pumping well is expected to be minimal.

A.3 References

ARCADIS. 2003. *Hydraulic Test Results (Bromide Tracer Test) – Former C-6 Facility.* April 18, 2003.

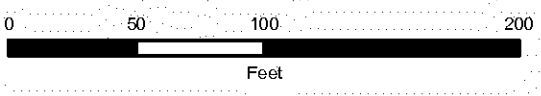
Kennedy/Jenks Consultants. 2000. *Groundwater Status Report, Boeing Realty Corporation, Former C-6 Facility, Los Angeles, California.* October 27, 2000.

Woodward-Clyde Consultants. 1990. *Douglas Aircraft Company, Torrance (C6) Facility, Preliminary Phase III Groundwater and Soil Investigation Report.* March 1990.

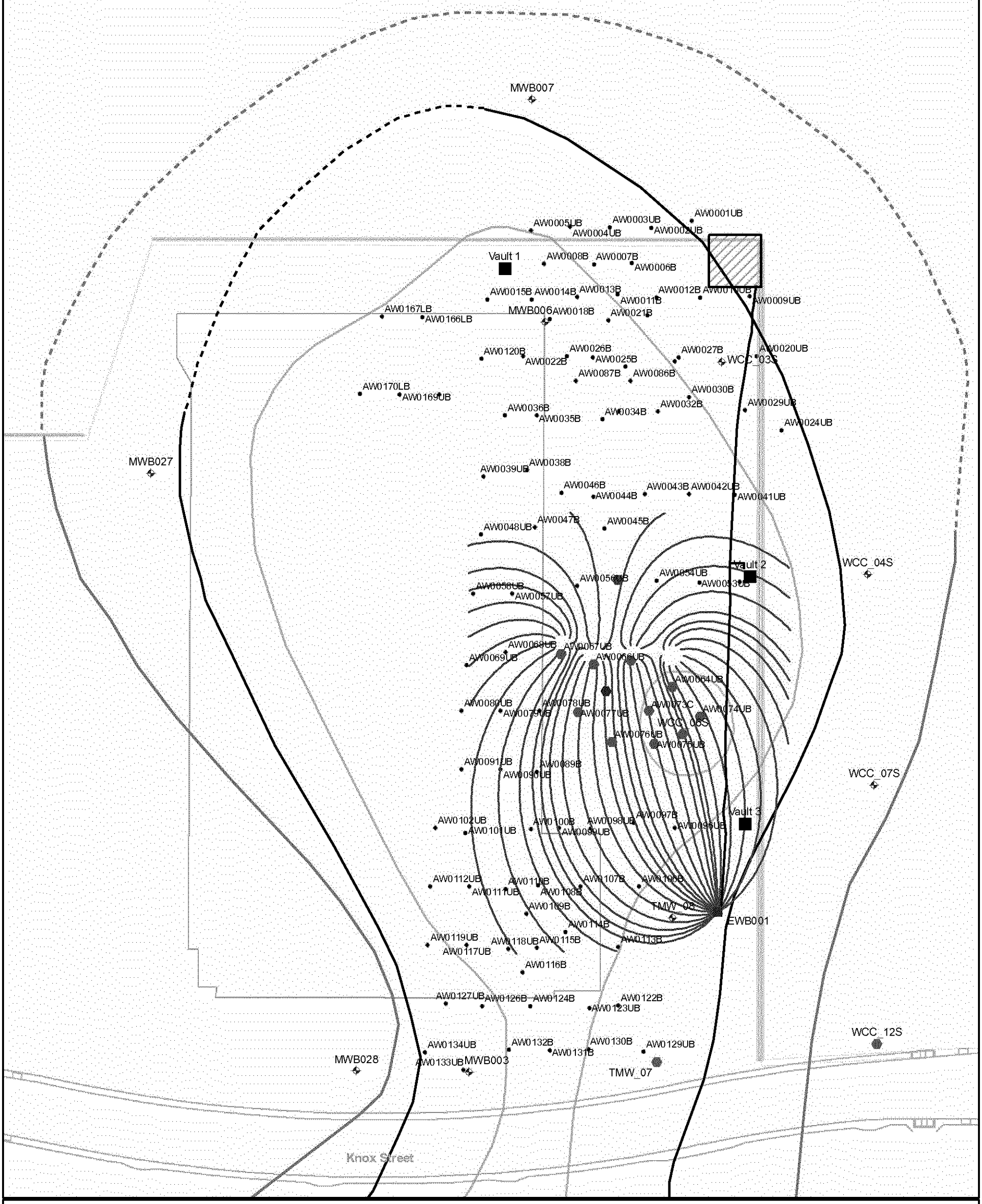
A.4 Figures

Figure 1 – Extraction Well Capture Zones
Figure 2 – Estimated Electron Donor Distribution at 30 days
Figure 3 – Estimated Electron Donor Distribution at 60 days
Figure 4 – Estimated Electron Donor Distribution at 90 days

NOTE:
1. Existing well vaults and conveyance piping, as shown, will be used to transport extracted groundwater to the treatment compound and amended water back to select amendment wells.
2. A limited subset of the existing amendment and monitoring wells will be used for the pilot study.



PARCEL A



March 12, 2007

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Legend

- Property Boundary
- Parcel Boundary
- Existing Compound
- Existing Vault
- B-Sand Extraction Well
- B-Sand Monitoring Well
- B-Sand Amendment Well
- Extraction Well Capture Zones
- Existing Spare Electrical Conduit and Water Piping
- Group A Amendment Well (Upper B-Sand)
- Proposed Group B Monitoring Well (Upper B-Sand)
- Group B Monitoring Well ((5) Upper B-Sand and (1) C-Sand)
- Group C Downgradient Well (B-Sand)
- Group D Upgradient Well (Upper B-Sand)

Boeing Realty Corporation
Former C-6 Facility
Proposed Biorecirculation Pilot Study Well Layout

Figure 1

0 50 100 200

Feet

N

PARCEL A

MWB007
AW0005UB AW0003UB AW0001UB
AW0004UB AW0002UB
AW0008B AW0007B
AW0006B
AW0015B AW0011B AW0012B AW0009UB
AW0167LB MWB006 AW0021B AW0010UB
AW0166LB
AW0120B AW0026B AW0027B WCC_03S
AW0022B
AW0087B AW0086B
AW0170LB AW0030B
AW0169UB AW0032B AW0029UB
AW0036B AW0034B
AW0035B AW0024UB
MWB027
AW0039UB AW0038B
AW0046B AW0043B
AW0044B AW0042UB
AW0048UB AW0047B AW0045B
WCC_04S
AW0058UB AW0054UB
AW0057UB AW0055UB
AW0068UB AW0067UB
AW0069UB AW0066UB
WCC_05S
AW0064UB
AW0080UB AW0078UB
AW0079UB AW0077UB
WCC_06S
AW0076UB
AW0075UB
AW0091UB AW0089B
AW0090UB
WCC_07S
AW0102UB AW0100B AW0097B
AW0101UB AW0099UB AW0096UB
AW0112UB AW0110B AW0107B
AW0111UB
AW0109B TMW_08
EWB001
AW0114B
AW0119UB AW0115B AW0113B
AW0117UB AW0118UB AW0116B
AW0127UB AW0126B AW0122B
AW0124B AW0123UB
WCC_12S
AW0132B AW0130B
AW0131B TMW_07
MWB028 MWB003
WCC_09S
Knox Street

March 12, 2007

Legend

- Property Boundary
- Parcel Boundary
- Existing Compound
- Existing Spare Electrical Conduit and Water Piping
- Estimated Electron Donor Distribution at 30 Days
- B-Sand Monitoring Well
- B-Sand Extraction Well
- B-Sand Amendment Well
- Group A Amendment Well (Upper B-Sand)
- Proposed Group B Monitoring Well (Upper B-Sand)
- Group B Monitoring Well ((5) Upper B-Sand and (1) C-Sand)
- Group C Downgradient Well (B-Sand)
- Group D Upgradient Well (Upper B-Sand)

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Boeing Realty Corporation
Former C-6 Facility
Former Building 1/36 Area
Estimated Electron Donor Distribution at 30 Days

Figure 2

0 50 100 200

Feet

N

PARCEL A

MWB007
AW0005UB AW0003UB AW0001UB
AW0004UB AW0002UB
AW0008B AW0007B
AW0006B
AW0015B AW0011B AW0012B AW0009UB
AW0167LB MWB006 AW0021B AW0010UB
AW0166LB
AW0120B AW0026B AW0027B WCC_03S
AW0022B
AW0087B AW0086B
AW0170LB AW0030B
AW0169UB AW0032B AW0029UB
AW0036B AW0034B
AW0035B AW0024UB
MWB027
AW0039UB AW0038B
AW0046B AW0043B
AW0044B AW0042UB
AW0048UB AW0047B AW0045B
WCC_04S
AW0058UB AW0054UB
AW0057UB
AW0068UB AW0067UB
AW0069UB AW0066UB
WCC_05S
AW0064UB
AW0080UB AW0078UB
AW0079UB AW0077UB
WCC_06S
AW0076UB
AW0075UB
AW0091UB AW0089B
AW0090UB
WCC_07S
AW0102UB AW0100B AW0097B
AW0101UB AW0099UB AW0096UB
AW0112UB AW0110B AW0107B
AW0111UB
AW0109B TMW_08
EWB001
AW0114B
AW0119UB AW0115B AW0113B
AW0117UB AW0118UB AW0116B
AW0127UB AW0126B AW0122B
AW0124B AW0123UB
WCC_12S
AW0132B AW0130B TMW_07
AW0131B
MWB028 MWB003
WCC_09S
Knox Street

March 12, 2007

CDM

Legend

- Property Boundary
- Parcel Boundary
- Existing Compound
- Existing Spare Electrical Conduit and Water Piping
- Estimated Electron Donor Distribution at 60 Days
- B-Sand Monitoring Well
- B-Sand Extraction Well
- B-Sand Amendment Well
- Group A Amendment Well (Upper B-Sand)
- Proposed Group B Monitoring Well (Upper B-Sand)
- Group B Monitoring Well ((5) Upper B-Sand and (1) C-Sand)
- Group C Downgradient Well (B-Sand)
- Group D Upgradient Well (Upper B-Sand)

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Former C-6 Facility
Former Building 1/36 Area
Estimated Electron Donor Distribution at 60 Days

Figure 3

0 50 100 200

Feet

N

PARCEL A

MWB007
AW0005UB AW0003UB AW0001UB
AW0004UB AW0002UB
AW0008B AW0007B
AW0006B
AW0015B AW0011B AW0012B AW0009UB
AW0167LB MWB006 AW0021B AW0010UB
AW0166LB
AW0120B AW0026B AW0027B WCC_03S
AW0022B
AW0087B AW0086B
AW0170LB AW0030B
AW0169UB AW0032B AW0029UB
AW0036B AW0034B
AW0035B AW0024UB
MWB027
AW0039UB AW0038B
AW0046B AW0043B
AW0044B AW0042UB
AW0048UB AW0047B AW0045B
WCC_04S
AW0058UB AW0054UB
AW0057UB
AW0068UB AW0067UB
AW0069UB AW0066UB
WCC_05S
AW0080UB AW0079UB AW0077UB
WCC_06S
AW0076UB
AW0075UB
AW0091UB AW0089B
AW0090UB
WCC_07S
AW0102UB AW0100B AW0097B
AW0101UB AW0099UB AW0096UB
AW0112UB AW0110B AW0107B
AW0111UB
AW0109B TMW_08
EWB001
AW0114B
AW0119UB AW0115B AW0113B
AW0117UB AW0118UB AW0116B
AW0127UB AW0126B AW0122B
AW0124B AW0123UB
WCC_12S
AW0132B AW0130B
AW0131B TMW_07
MWB028 MWB003
WCC_09S
Knox Street

March 12, 2007

Legend

- Property Boundary
- Parcel Boundary
- Existing Compound
- Existing Spare Electrical Conduit and Water Piping
- Estimated Electron Donor Distribution at 90 Days
- B-Sand Monitoring Well
- B-Sand Extraction Well
- B-Sand Amendment Well
- Group A Amendment Well (Upper B-Sand)
- Proposed Group B Monitoring Well (Upper B-Sand)
- Group B Monitoring Well ((5) Upper B-Sand and (1) C-Sand)
- Group C Downgradient Well (B-Sand)
- Group D Upgradient Well (Upper B-Sand)

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Boeing Realty Corporation
Former C-6 Facility
Former Building 1/36 Area
Estimated Electron Donor Distribution at 90 Days

Figure 4

Attachment B
New Well Construction Procedures

This attachment provides the procedure for installing a new groundwater monitoring well during the pilot biorecirculation test at the Site. The well will be constructed so that it can serve as an extraction well for future operations.

The well will be installed in accordance with the applicable portions of the standard operating procedures (SOPs) for drilling, soil sampling, well installation, well development, and related activities prepared by Haley & Aldrich and included in Appendix A of the Pre-Remediation Implementation Work Plan (CDM, August 7, 2006). Additional details and deviations from the SOPs are provided below. Actual well location will be adjusted in the field to be accessible via the existing subsurface infrastructure (piping laterals, electrical conduits, etc.), as appropriate, to minimize surface disturbance. The following sections provide descriptions for field implementation.

B.1 Pre-Field Activities

- Prepare and submit to BRC the Boeing Pre-Fieldwork Checklist.
- Prior to any intrusive work, utility information, including maps of the existing buildings and remediation infrastructure will be reviewed and a Site visit will be conducted to locate utilities, mark well locations, and determine Site clearing needs for drill rig access. All site visits will be coordinate with BRC and Haley & Aldrich.
- Underground Service Alert will be notified a minimum of two working days in advance to allow adequate time for marking the locations of subsurface utilities. A geophysical survey at the proposed well location followed by hand augering at three locations (triangular) to a depth of 10 feet below ground surface (bgs) around the proposed well location for further utility clearance.
- The necessary well installation permits will be obtained from the Los Angeles County Department of Health Services.

B.2 Well Installation

- One B-Sand well is proposed to be installed using the sonic drilling method to a maximum depth of 85 to 90 feet bgs. Proposed well construction details are provided in Table B-1.
- Continuous core samples will be collected at the B-Sand Unit interface (expected to be from 55 to 85 feet bgs) to verify proper placement of the well screen. A 6-inch, Schedule

80 polyvinyl chloride (PVC) casing, flush jointed threaded and coupled with O-Ring seals, will be installed with at 20 to 30 feet of Schedule 80 PVC screen with slot size of 0.020-inch. The filter pack will consist of well graded sand that retains greater than 95 percent on this screen size (i.e. No. 10-20 Colorado silica sand or #3 Monterey sand) and will be installed in the annular space to approximately 3-feet above the screen. The sonic drill rig uses vibration of the rig prior to setting the bentonite seal to promote settlement of the filter pack. A 2-foot thick plug of coated bentonite pellets will be installed above the filter pack and allowed to hydrate for 45 minutes. After the pellets have been hydrated, cement grout will be placed via a tremie pipe in the remaining annular space to land surface. The well will then be completed with a locking well cap in a traffic-rated locking road box.

The well construction details for the extraction wells will be recorded on field forms. The boring will be logged geologically using the soil samples.

- Investigation derived waste (IDW) (e.g., drill cuttings, development water) will be containerized, labeled, characterized, and properly stored pending laboratory analyses and disposal determination. Soil cuttings will be placed in 55-gallon drums or roll-off bins which will be located at BRC-approved on-site locations. Well development water will be stored in 55-gallon drums and transferred to the existing tank in the SVE compound located at the northeastern corner of Bldg 1/36. The soil cuttings and water will be sampled and analyzed by a BRC-approved laboratory The IDW will be properly manifested and disposed by CDM following receipt of laboratory results.

- The well locations and wellhead elevations will be surveyed using California State Plane Zone 5 Coordinates, North American Datum of 1983 (NAD 83) and North American Vertical Datum of 1988 (NAVD 88).

- The drilling subcontractor will submit well completion forms to Los Angeles County Department of Health Services.

B.3 Well Development

Development of the well will consist of initial development (pre-development) during construction of the well, to settle the filter pack, and development of the well a minimum of 72 hours following placement of the surface seal to remove drilling fluids and fines from within the screen zone and increase hydraulic communication with the formation of the water bearing units. This task will consist of the following activities:

- Before development, static groundwater levels will be measured in the well and the surrounding observation wells.

- Well development will consist of mechanical surging or jetting followed by bailing and pumping of the well. The purpose of this development is to remove drilling fluids and fines from within the aquifer adjacent to the screen zone. Bailing and pumping methods will be used in combination to remove water containing suspended fine-grained material and to induce groundwater flow through the filter pack into the well. Development will be deemed completed when turbidity levels are less than 50 NTUs after 1-hour of pumping at constant rate (rate to be determined).

- IDW including drill cuttings, development water, etc., will be stored in 55-gallon drums and transferred to the existing tank in the SVE compound located at the northeastern corner of Bldg 1/36, or other additional approved containers as needed and stored on-Site at a location selected by BRC pending laboratory analyses and disposal determination. The IDW will be properly manifested and disposed of by CDM following receipt of laboratory results.

Table B-1

Proposed Groundwater Monitoring/Extraction Well Completion Details
Former Bldg. 1/36 Pilot Biorecirculation Test
Remediation of Volatile Organic Compounds
Former C-6 Facility, Los Angeles, California

Proposed Well I.D.	Site Location	Casing Diameter (inches)	Boring Anticipated Total Depth (feet)	Screen Depth Interval (feet) [1]	Casing Type	Screen Slot Size (inches)
EWB002	Bldg 1/36	6	90	55 - 90	Sch 80 PVC	0.02

[1] Actual screen depth interval and screen length to be determined based on continuous core samples collected in this depth interval

Attachment C
Overview of Portable Whey Injection Unit

The portable injection system allows for injection of solid-phase nutrients into injection wells for in situ bioremediation applications. The primary purpose of the portable injection system is to make injections of solid-phase nutrients applicable at many sites where permanent construction of an injection system is not feasible for in situ bioremediation applications. The major components of the system include a pneumatic vacuum, metered screw feeder, wash-down hopper, eductor, flow meters and generator. A brief description of each part of the portable injection system is described below:

Metered Screw Feed

The screw feeder meters amendment at a desired flow rate into the washdown hopper. The screw feeder is equipped with an electric vibrator to ensure that the amendment flows smoothly into and through the screw feeder to the washdown hopper. The screw feeder is equipped with a variable speed controller that can be adjusted to set the feed rate desired for the desired amendment. The vibrator is an asynchronous motor which has adjustable eccentric weights mounted on each end of the rotor shaft.

Washdown Hopper

The washdown hopper washes down and pre-mixes the amendment with water to allow the amendment to flow to the eductor where the amendment is completely mixed before injection into a well. The washdown hopper is a SST cone-shaped hopper with a top diameter of 16" and a bottom diameter of 2". It is fitted with four brass deflected wide-angle flat fan spray nozzles to wash down the amendment. The washdown hopper is equipped with a lid that has a 3" SST feed inlet tube and a 1-1/2" diameter air vent.

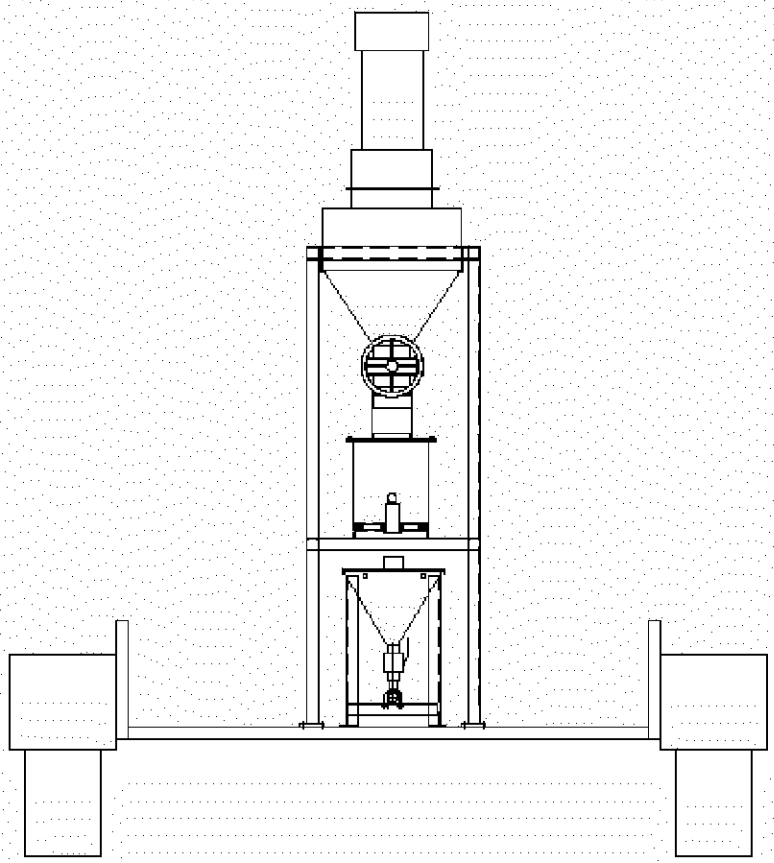
Eductor

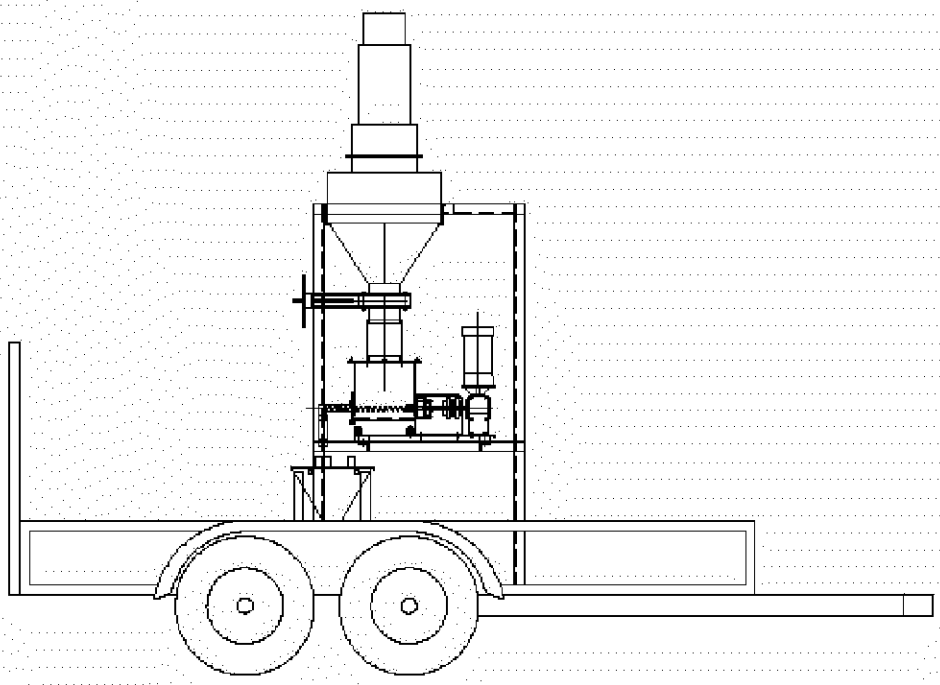
The eductor is a liquid slurry eductor where the water and amendment are mixed before discharge into an injection well. The eductor is a ¾-inch Fox slurry eductor with an ½-inch male NPT inlet and a ¾-inch male NPT suction and discharge. The design flow rate of water through the eductor is 12-15 gpm at 70-100 psig.

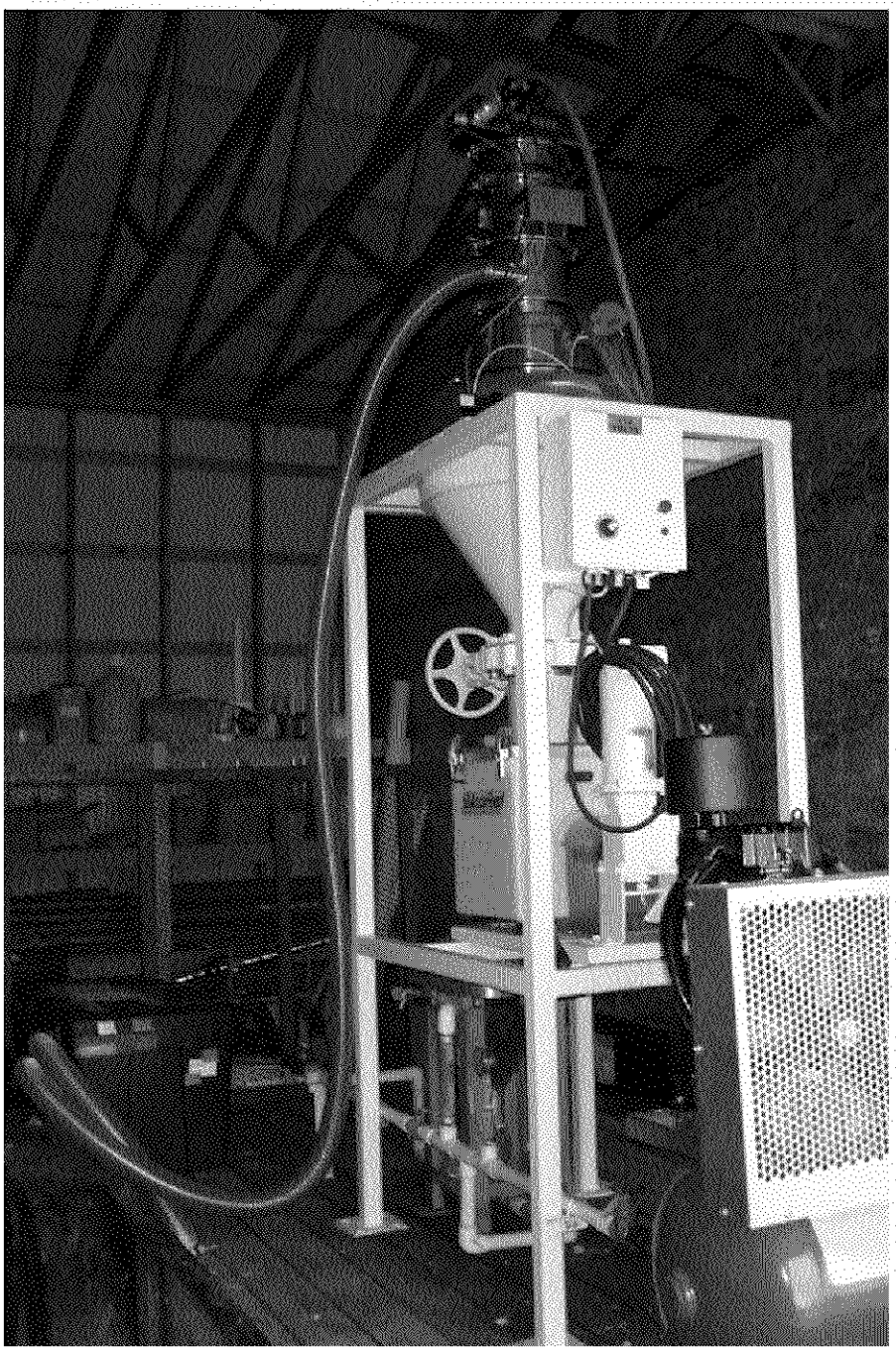
Flow meters

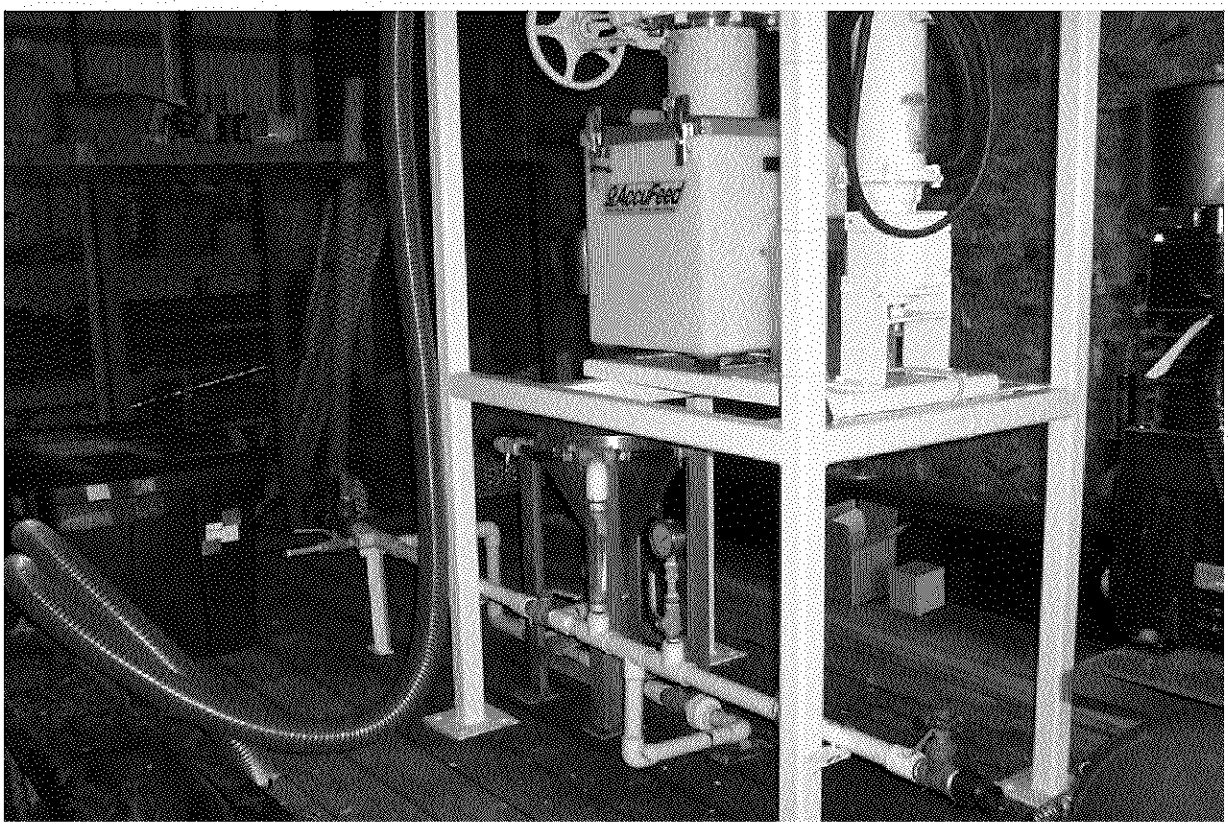
The flow meters are used to measure the flow through the injection system. The flow meters include an influent flow indicator, a flow meter on the washdown hopper feed line and a flow meters on the effluent lines.

Elevation drawings and pictures of the portable unit are included in the following pages





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